

# Baboon study shows benefits for nice guys

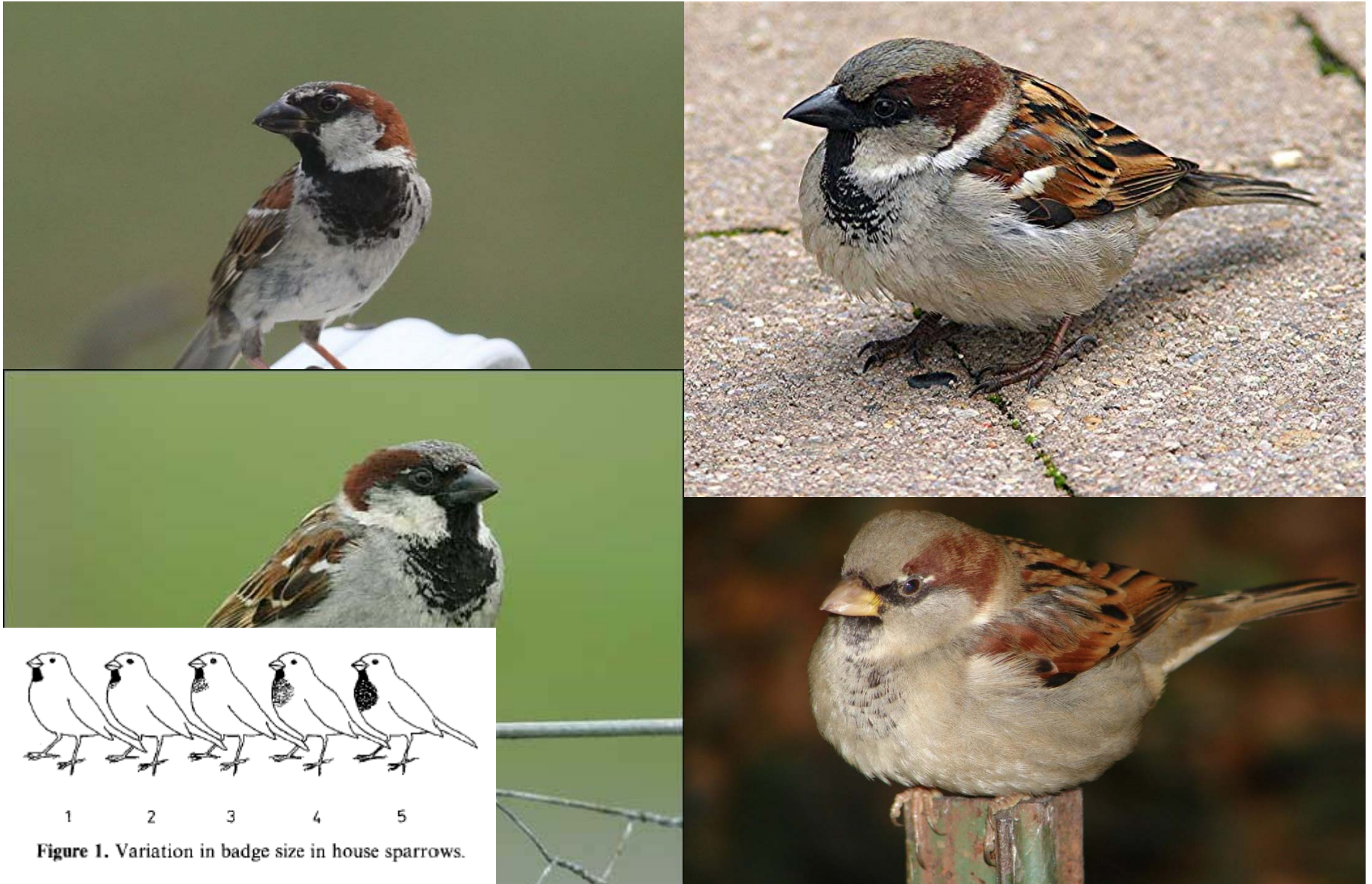
1. What is nice about this study? –long term study of free ranging animals in the wild, sample collected, minimum disturbance of animals.
2. What is the differences in ranking-related stress between male and female baboons?
3. How the stress hormones may affect health in the short term?  
And in the long term?
4. The effect of long-term stress on human and baboon health?  
Why there might be a smaller health effect on baboons.
5. What is the difference in social hierarchy between human and baboon society?
6. Best behavioral strategies?

# Most common birds in New York City



House sparrow (introduced)

# House sparrow (male dominance hierarchy)



What is Animal Cognition?

What is cognition?

## Problem solving in crows



WHO TAUGHT THE RAVEN IN A DROUGHT TO  
THROW PEBBLES INTO A HOLLOW TREE, WHERE  
SHE ESPIED WATER, THAT THE WATER MIGHT  
RISE SO AS SHE COULD COME TO IT?

Francis Bacon, 1605





*Thomas Bewick*

*Select Fables of  
Aesop and others,  
1784*

*FABLE XLVIII.*

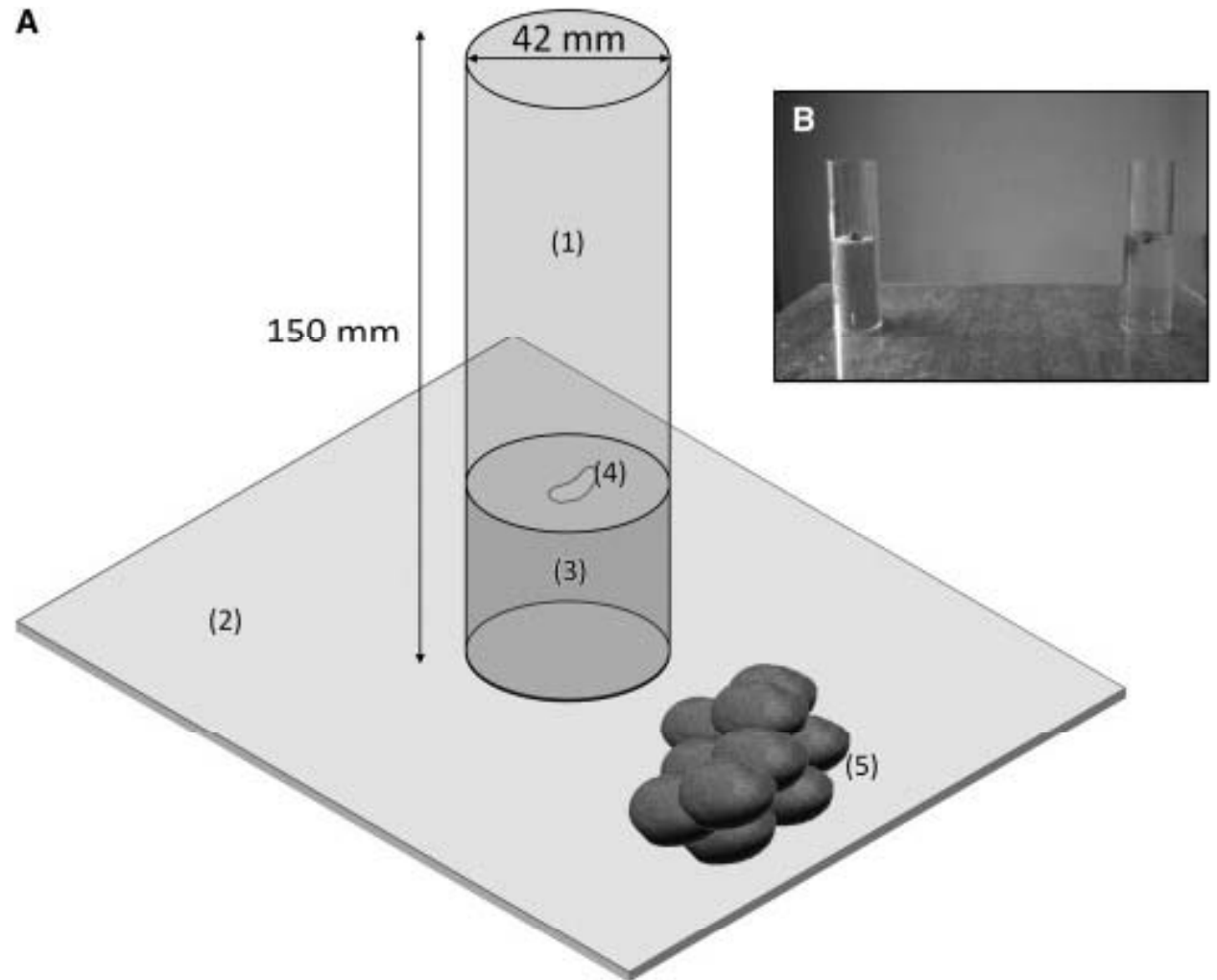
*The Crow and the Pitcher.*

A CROW, ready to die with thirst, flew with joy to a pitcher which he beheld at some distance. When he came, he found water in it indeed, but so near the bottom, that with all his stooping and straining, he was not able to reach it. Then he endeavoured to overturn the pitcher, that so at least he might be able to get a little of it; but his strength was not sufficient for this. At last, seeing some pebbles lie near the place, he cast them one by one into the pitcher; and thus, by degrees, raised the water up to the very brim, and satisfied his thirst.

# Experimental designs



Rook

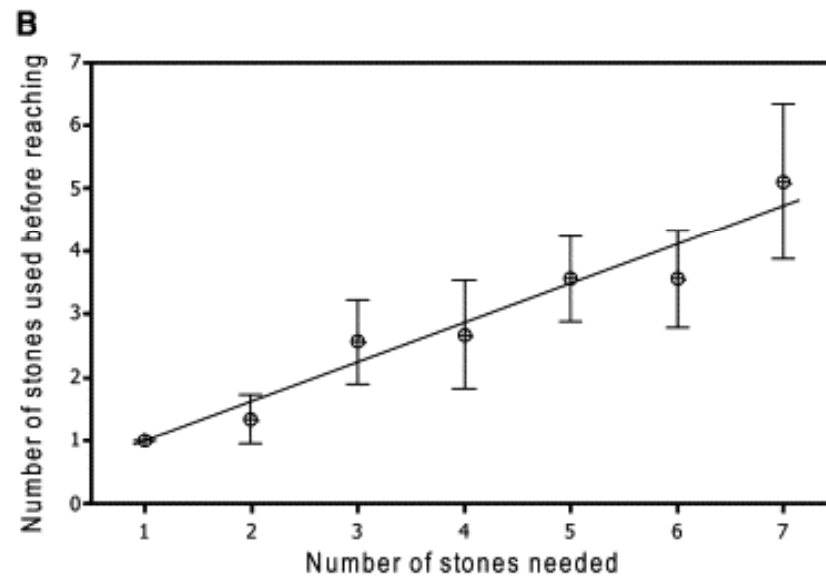
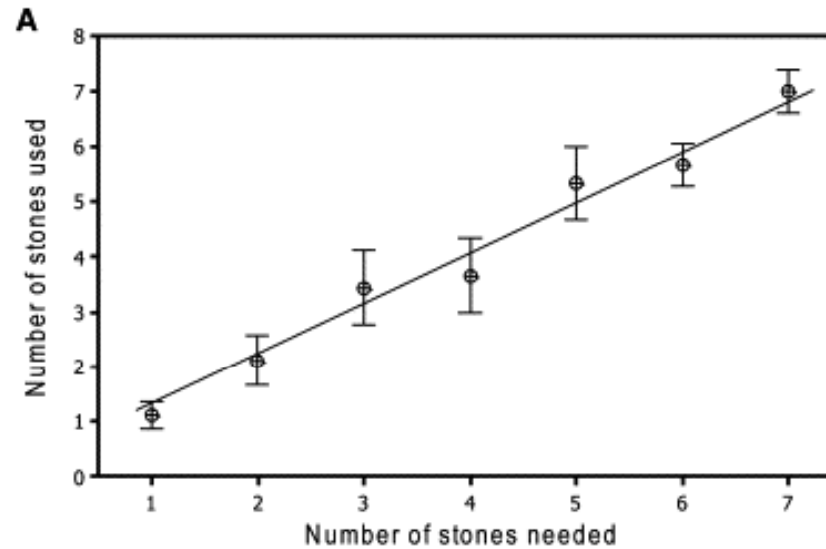




How does the rook (crow family) get the worm?



Put in only the exact number of stones needed to raise the water level to a reachable height



# Require trial and error

| Connelly     |    |                      |   |   |   |   |   |   |   |   |    |
|--------------|----|----------------------|---|---|---|---|---|---|---|---|----|
|              |    | Order of stones used |   |   |   |   |   |   |   |   |    |
|              |    | 1                    | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Trial number | 1  |                      |   |   |   |   |   |   |   |   |    |
|              | 2  |                      |   |   |   |   |   |   |   |   |    |
|              | 3  |                      |   |   |   |   |   |   |   |   |    |
|              | 4  |                      |   |   |   |   |   |   |   |   |    |
|              | 5  |                      |   |   |   |   |   |   |   |   |    |
|              | 6  |                      |   |   |   |   |   |   |   |   |    |
|              | 7  |                      |   |   |   |   |   |   |   |   |    |
|              | 8  |                      |   |   |   |   |   |   |   |   |    |
|              | 9  |                      |   |   |   |   |   |   |   |   |    |
|              | 10 |                      |   |   |   |   |   |   |   |   |    |
|              | 11 |                      |   |   |   |   |   |   |   |   |    |
|              | 12 |                      |   |   |   |   |   |   |   |   |    |
|              | 13 |                      |   |   |   |   |   |   |   |   |    |
|              | 14 |                      |   |   |   |   |   |   |   |   |    |
|              | 15 |                      |   |   |   |   |   |   |   |   |    |
|              | 16 |                      |   |   |   |   |   |   |   |   |    |
|              | 17 |                      |   |   |   |   |   |   |   |   |    |
|              | 18 |                      |   |   |   |   |   |   |   |   |    |
|              | 19 |                      |   |   |   |   |   |   |   |   |    |
|              | 20 |                      |   |   |   |   |   |   |   |   |    |

| Monroe       |    |                      |   |   |   |   |   |   |   |   |    |
|--------------|----|----------------------|---|---|---|---|---|---|---|---|----|
|              |    | Order of stones used |   |   |   |   |   |   |   |   |    |
|              |    | 1                    | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
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|              | 5  |                      |   |   |   |   |   |   |   |   |    |
|              | 6  |                      |   |   |   |   |   |   |   |   |    |
|              | 7  |                      |   |   |   |   |   |   |   |   |    |
|              | 8  |                      |   |   |   |   |   |   |   |   |    |
|              | 9  |                      |   |   |   |   |   |   |   |   |    |
|              | 10 |                      |   |   |   |   |   |   |   |   |    |
|              | 11 |                      |   |   |   |   |   |   |   |   |    |
|              | 12 |                      |   |   |   |   |   |   |   |   |    |
|              | 13 |                      |   |   |   |   |   |   |   |   |    |
|              | 14 |                      |   |   |   |   |   |   |   |   |    |
|              | 15 |                      |   |   |   |   |   |   |   |   |    |
|              | 16 |                      |   |   |   |   |   |   |   |   |    |
|              | 17 |                      |   |   |   |   |   |   |   |   |    |
|              | 18 |                      |   |   |   |   |   |   |   |   |    |
|              | 19 |                      |   |   |   |   |   |   |   |   |    |
|              | 20 |                      |   |   |   |   |   |   |   |   |    |

| Cook         |    |                      |   |   |   |   |   |   |   |   |    |
|--------------|----|----------------------|---|---|---|---|---|---|---|---|----|
|              |    | Order of stones used |   |   |   |   |   |   |   |   |    |
|              |    | 1                    | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Trial number | 1  |                      |   |   |   |   |   |   |   |   |    |
|              | 2  |                      |   |   |   |   |   |   |   |   |    |
|              | 3  |                      |   |   |   |   |   |   |   |   |    |
|              | 4  |                      |   |   |   |   |   |   |   |   |    |
|              | 5  |                      |   |   |   |   |   |   |   |   |    |
|              | 6  |                      |   |   |   |   |   |   |   |   |    |
|              | 7  |                      |   |   |   |   |   |   |   |   |    |
|              | 8  |                      |   |   |   |   |   |   |   |   |    |
|              | 9  |                      |   |   |   |   |   |   |   |   |    |
|              | 10 |                      |   |   |   |   |   |   |   |   |    |
|              | 11 |                      |   |   |   |   |   |   |   |   |    |
|              | 12 |                      |   |   |   |   |   |   |   |   |    |
|              | 13 |                      |   |   |   |   |   |   |   |   |    |
|              | 14 |                      |   |   |   |   |   |   |   |   |    |
|              | 15 |                      |   |   |   |   |   |   |   |   |    |
|              | 16 |                      |   |   |   |   |   |   |   |   |    |
|              | 17 |                      |   |   |   |   |   |   |   |   |    |
|              | 18 |                      |   |   |   |   |   |   |   |   |    |
|              | 19 |                      |   |   |   |   |   |   |   |   |    |
|              | 20 |                      |   |   |   |   |   |   |   |   |    |

Large stone

Small stone

Study animal mind:

~~Anthropomorphism~~



# Happiness of Fish

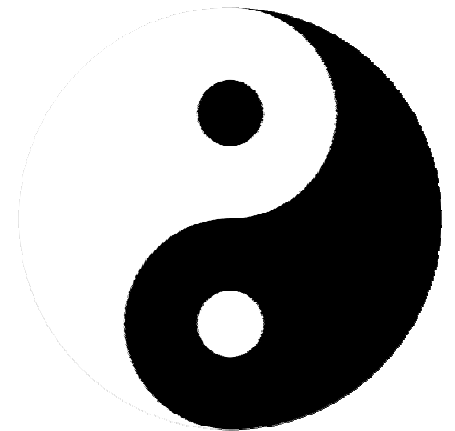
Zhuangzi and [Huizi](#) were strolling along the dam of the Hao Waterfall when Zhuangzi said, "See how the minnows come out and dart around where they please! That's what fish really enjoy!"

Huizi said, "You're not a fish — how do you know what fish enjoy?"

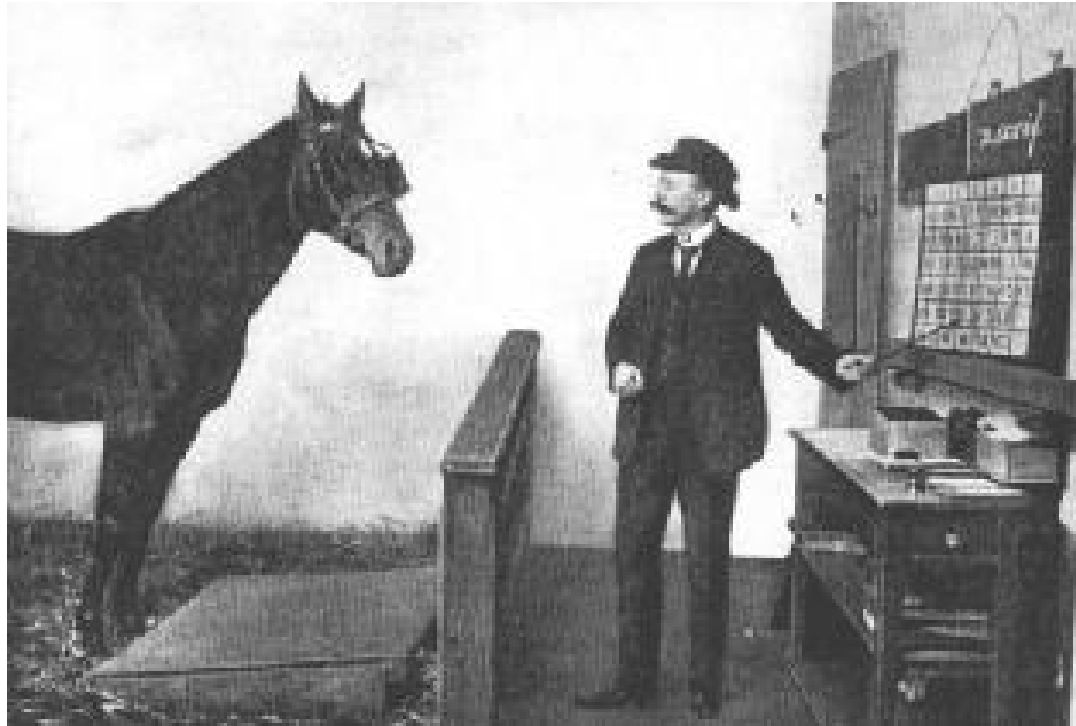
Zhuangzi said, "You're not me, so how do you know I don't know what fish enjoy?"

Huizi said, "I'm not you, so I certainly don't know what you know. On the other hand, you're certainly not a fish, so that still proves you don't know what fish enjoy!"

Zhuangzi said, "Let's go back to your original question, please. You asked me *how* I know what fish enjoy — so you already knew I knew it when you asked the question. I know it by standing here beside the Hao."



# Clever Hans



In late 1800s, a German mathematics professor, Von Osten, firmly believed that humanity had greatly underestimated the reasoning skills and intelligence of animals. He tested his idea with his horse, Hans.





“What is the square root of sixteen?” Four taps.

“What is the date of the following Monday?” Six hoof-taps .

89% accuracy.

Hans’ grasp of mathematics was equivalent to a fourteen-year-old’s.

However,

If the questioner to stand farther away, something interesting happened: the horse's accuracy diminished.

Or, if the questioner didn't know the answer to a question in advance, the accuracy of Hans' responses plummeted to nearly zero.



Hans was merely being receptive to the subtle, unconscious cues which were universally present in his human questioners. There is evidence to indicate that horses may possess an enhanced sensitivity to inconspicuous body language, perhaps as a key part of their social interactions with other horses.

What do you learn from this Clever Hans's story?

1. Horses are smart in their own way  
(sensitive to the facial expression )

1. Carefully design experiments and  
interpret results

Study animal mind:

Know the life history of animals



# The Blue tits open the milk bottles







# Are blue tits so smart?

Exercising a combination of insight  
and planning;  
Saw an opportunity and exploited it.



# Are blue tits so smart?

**Or** this behavior is part of their daily routine behavior, but they accidentally apply it to the bottle, and it works.

Animals are most  
“intelligent” to best  
adapt to its local  
species-specific  
environment.



Take home message:

Understand animal's natural behavior is essential to study their intelligence or mind.

Study of animal mind

invertebrates

Altruism behavior of eusocial insects

Study animal cognition:

Use social species:

Some social animals have  
altruism; sympathy



## Some examples:

Dolphins keep injured members of the group afloat.

Vampire bats share food (blood) with starving members of their colony.

Alarm calls of ground squirrels

Elephants mourns for the death of young or elder for weeks or months.

# Food sharing in blood-sucking vampire bats

## Tit for tat strategy



Female bats regurgitate blood meals to others that failed to obtain food

# Elephants mourn the dead



# Hippo's empathy



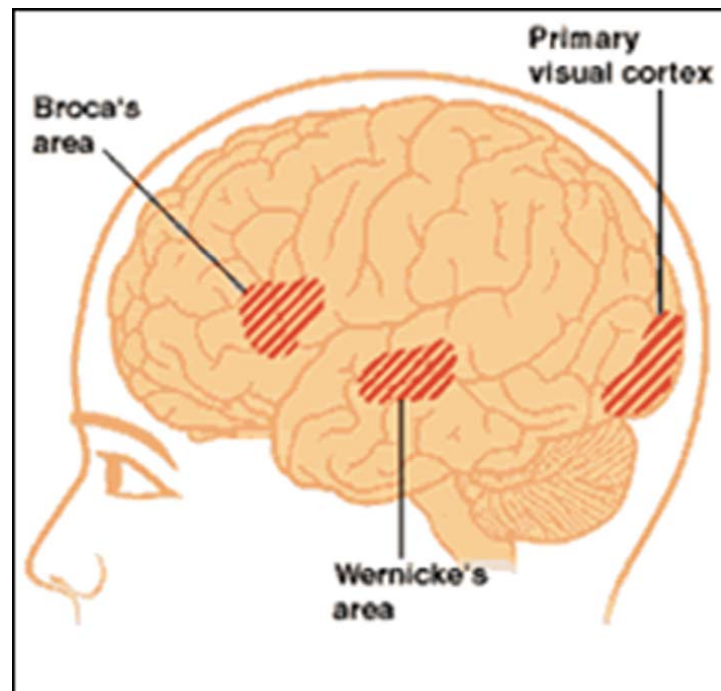
[ebaumsworld.com](http://ebaumsworld.com)

## Alex the parrot

1. Are Alex's vocalizations language?
2. Is Alex capable of thinking? Or it is another example of Clever Hans?  
Or is it another example of operant conditioning (Skinner box)?
3. What does Alex's performance differ from dolphins or chimps?
4. Which of the following views do you agree?
  - a. Dr. Herbert Terrace: Alex was doing a rote response: a complex discriminative performance. An external stimulus to guide Alex's response.
  - b. Dr. Donald Griffin: animals are capable of complex thought and behavior that are not instinctive.
  - c. Dr. Steven Pinker: even complex behavior/ thought in humans can be instinctive.



# Vocal mimics, sound perception and evolution of mind



# Vocal mimics and music





Vocal mimics/ speech learning/music  
similar process, brain areas

The logo for NewScientist, featuring the word "NewScientist" in a white, sans-serif font. The "New" is smaller and positioned to the left of "Scientist". The background is a dark blue gradient.

**NewScientist**

Parrot dancing linked to mimicry

# Study of animal mind:

## Invertebrates

Foraging behavior of honey bees  
--Waggle dance...

Cryptic behavior of octopus

Altruism, reciprocity, or sympathy require animals to understand a great deal about social relationship and group dynamics.

→ Individual understand and then manipulate or help each other.

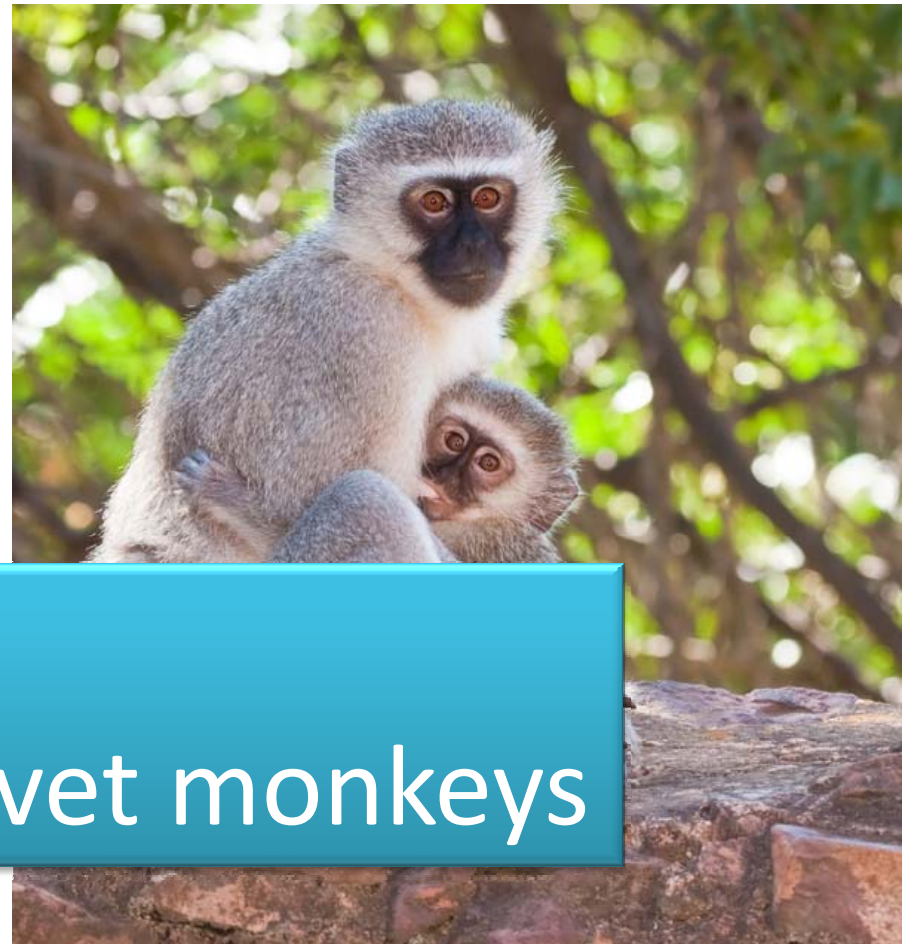
→ Show some degree of **self-awareness** ?

Social animals understand a great deal about social relationship and group dynamics.

Example #1:  
Alarm calls of Ground squirrels



Social animals understand a great deal about social relationship and group dynamics.



Example #2:  
Alarm calls of Velvet monkeys

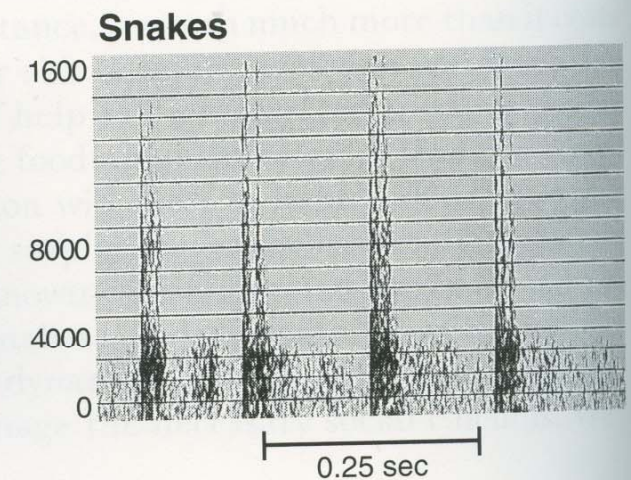
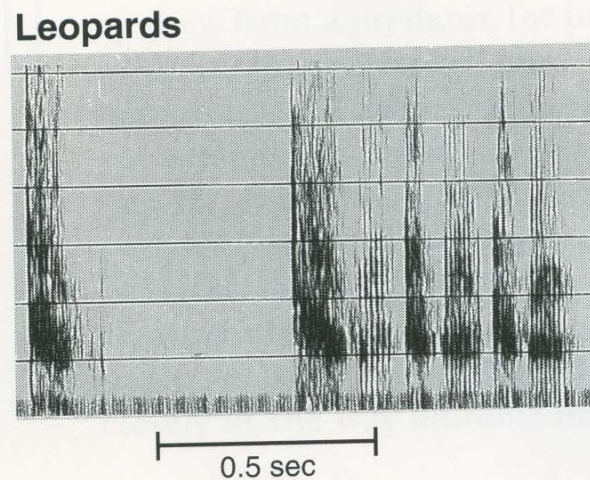
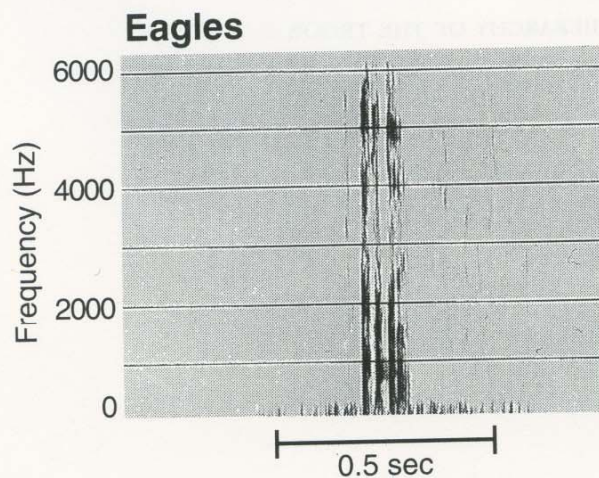
# Velvet monkey: four alarm calls

#1: for aerial predators (Eagles)

#2: for terrestrial predators (Leopards)

#3: for snakes

#4: for group-hunting predator.

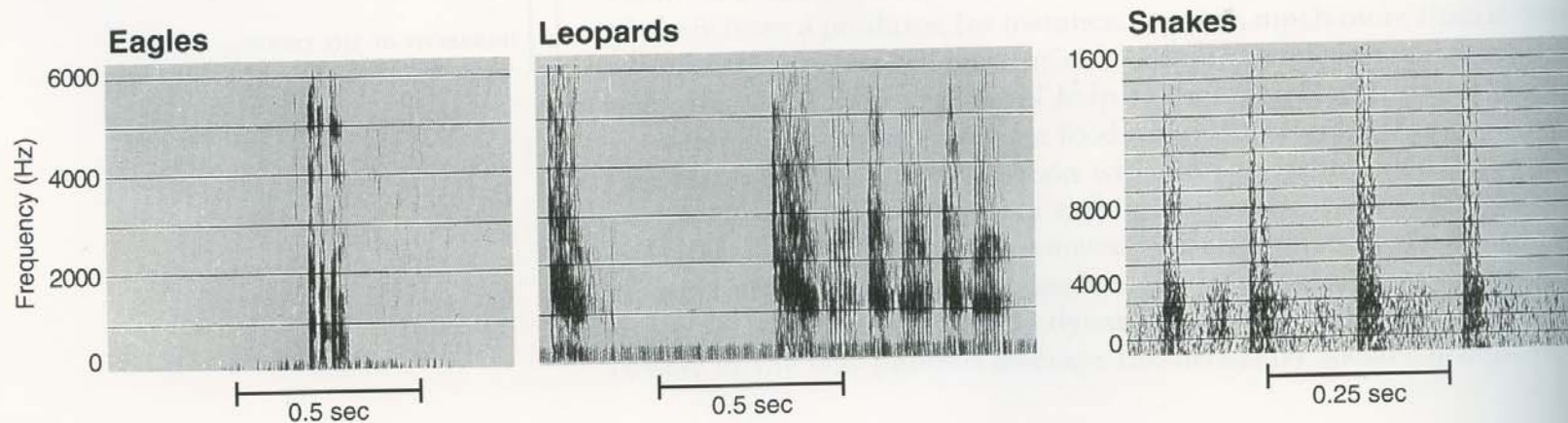




All of the calls are **innately** produced  
and **innately** recognized

But juveniles still have to learn from adults  
what is the real threat.

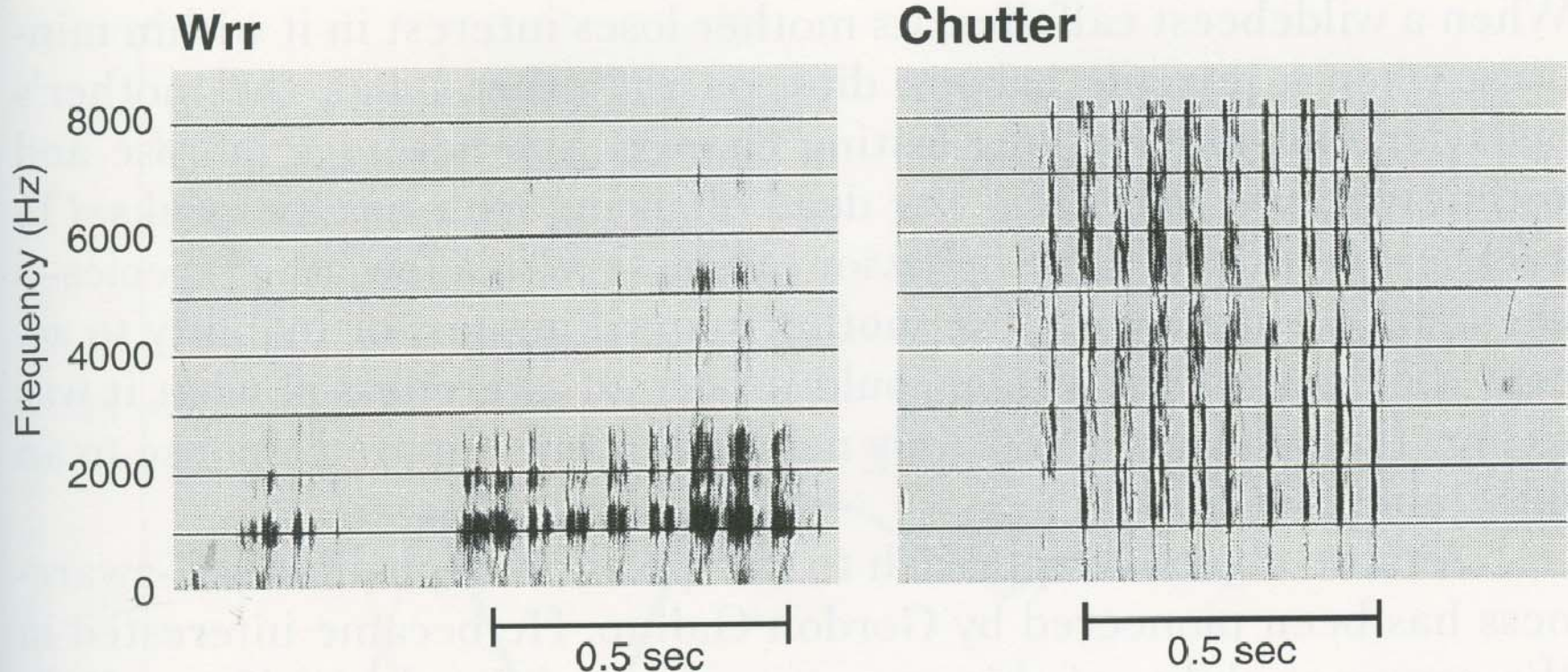
They understand exactly what each call means,  
How credible each caller is.



## Velvet monkey: two other calls

#1: Wrr call: signals the initial sighting of another group

#2: Chutter call: serious signals that induces more aggressive interaction





Group members have different responses toward these calls dependent on who is the caller.

They understand their own and on another's social standing and adjust their behavior accordingly.

But, does this imply the monkeys have a **self-image**?

# Self-Image (self-awareness)

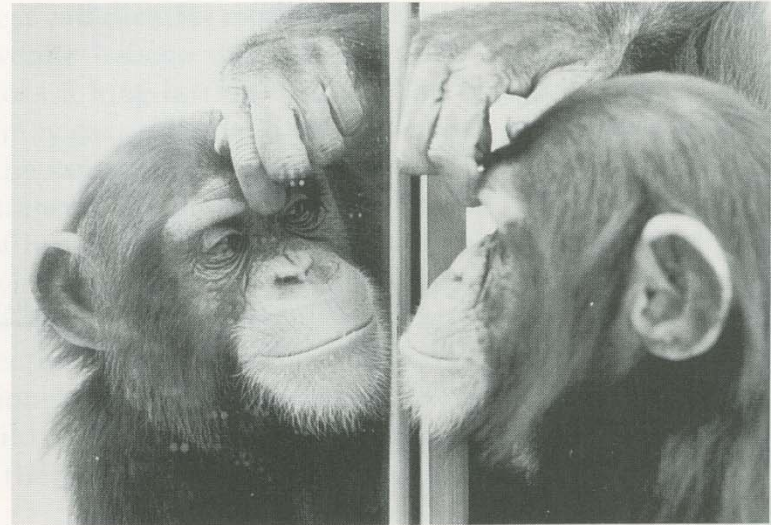


How do you test?

# Mirror tests in primates

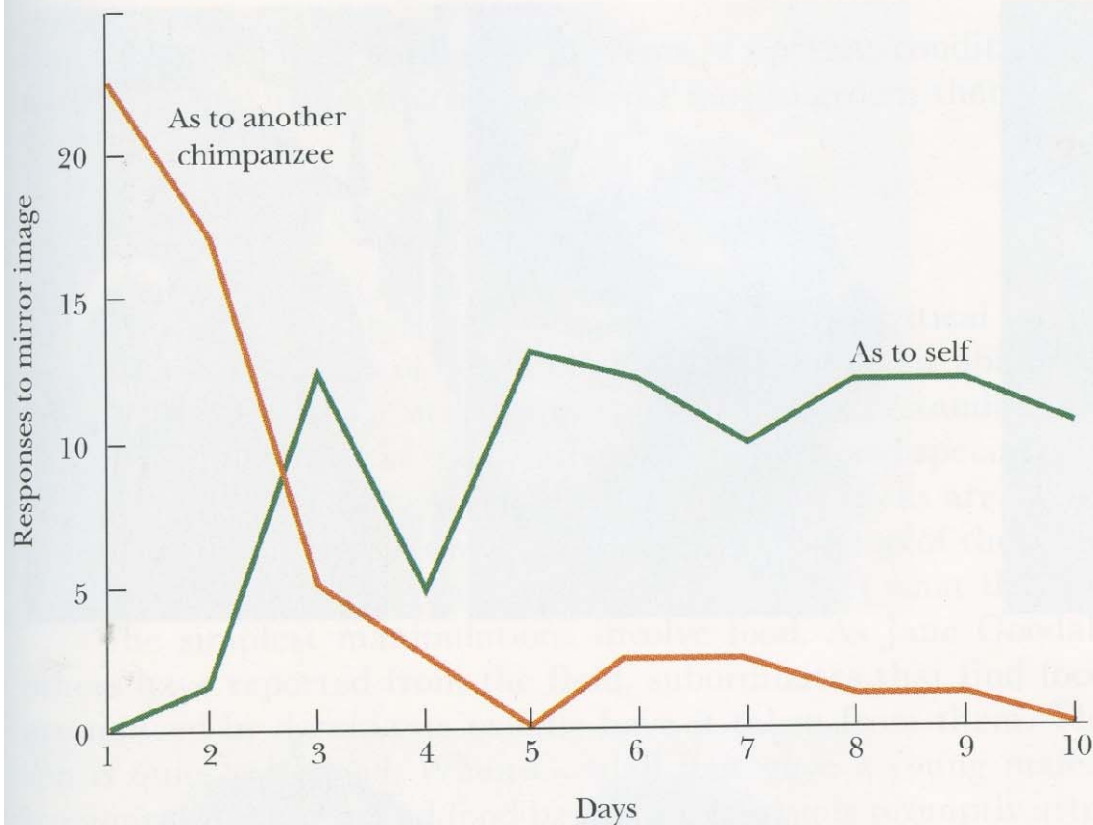


# Self image– Self awareness?



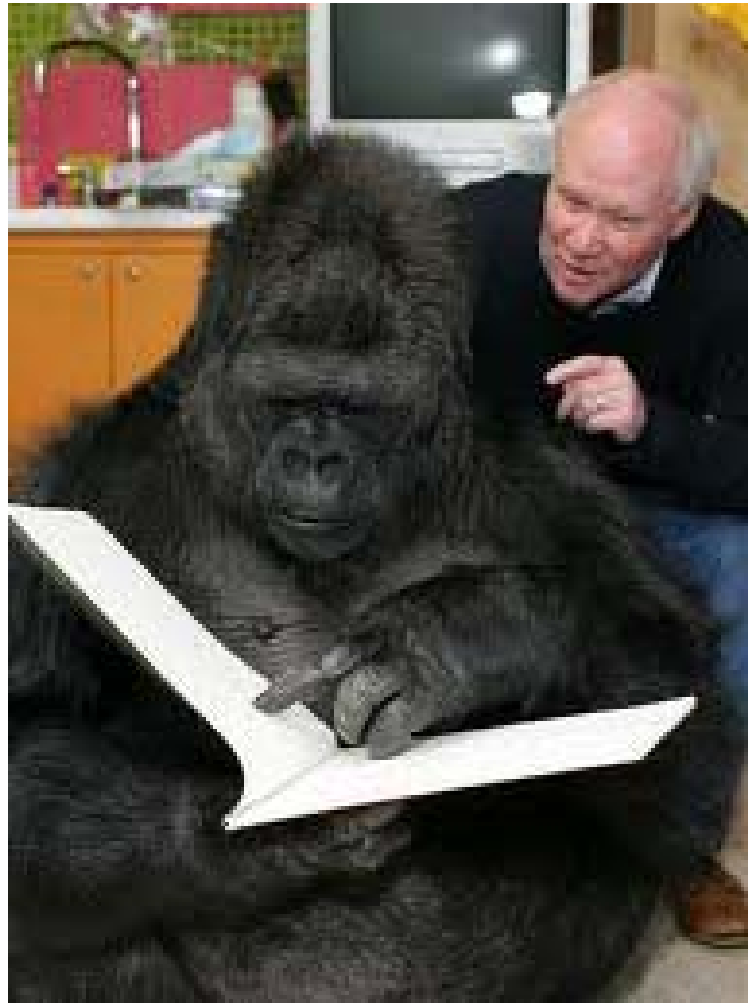


# Self-Image (self-awareness)

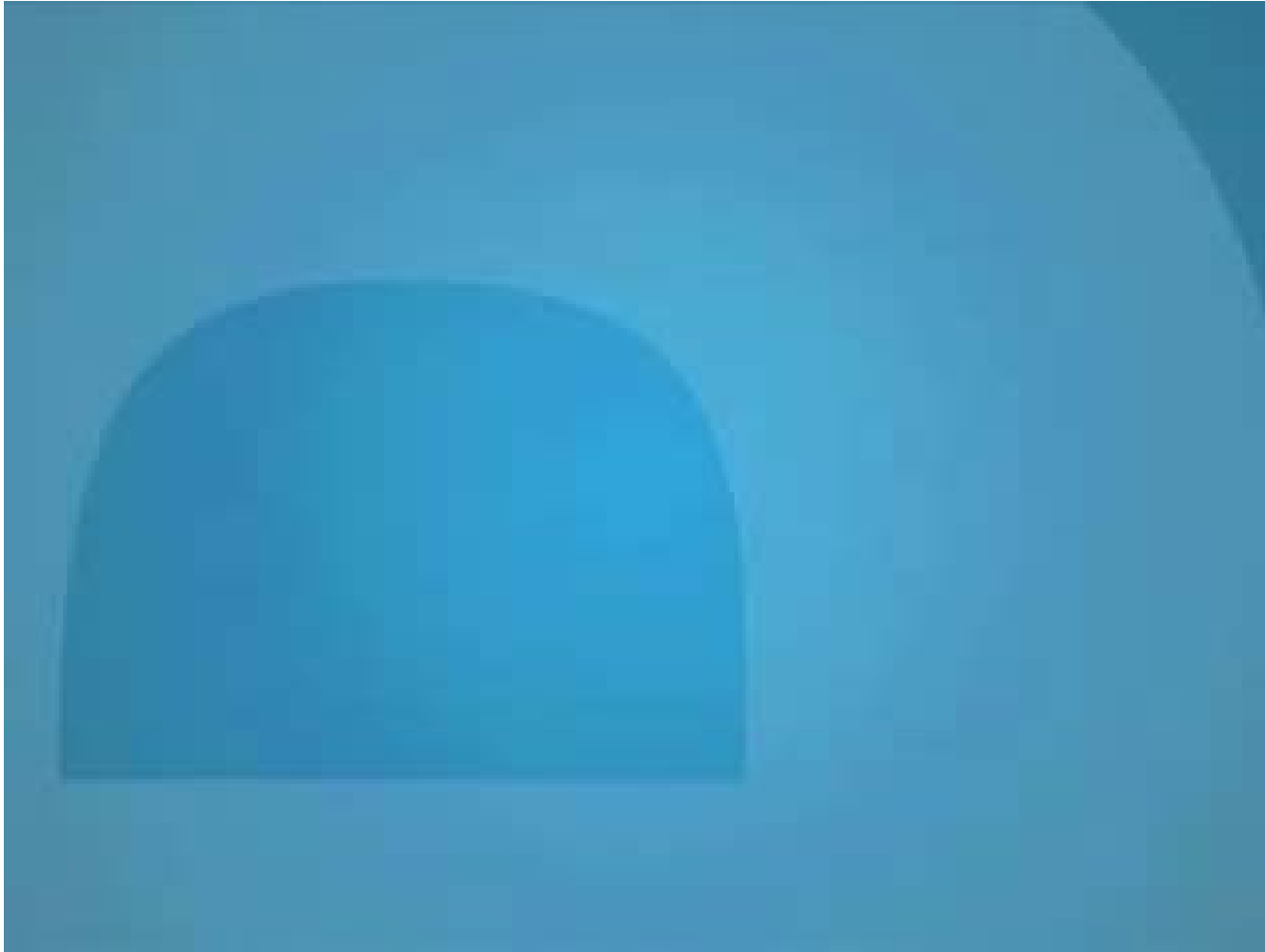


Chimpanzees respond initially to a mirror image as though it were another chimp, reacting with social gestures. Within a very few days, however, the chimp figures out what is going on and begins using the mirror for self-grooming.

Koko the gorilla used a mirror to apply makeup



Even some birds can do it too...



Magpie (crow family)

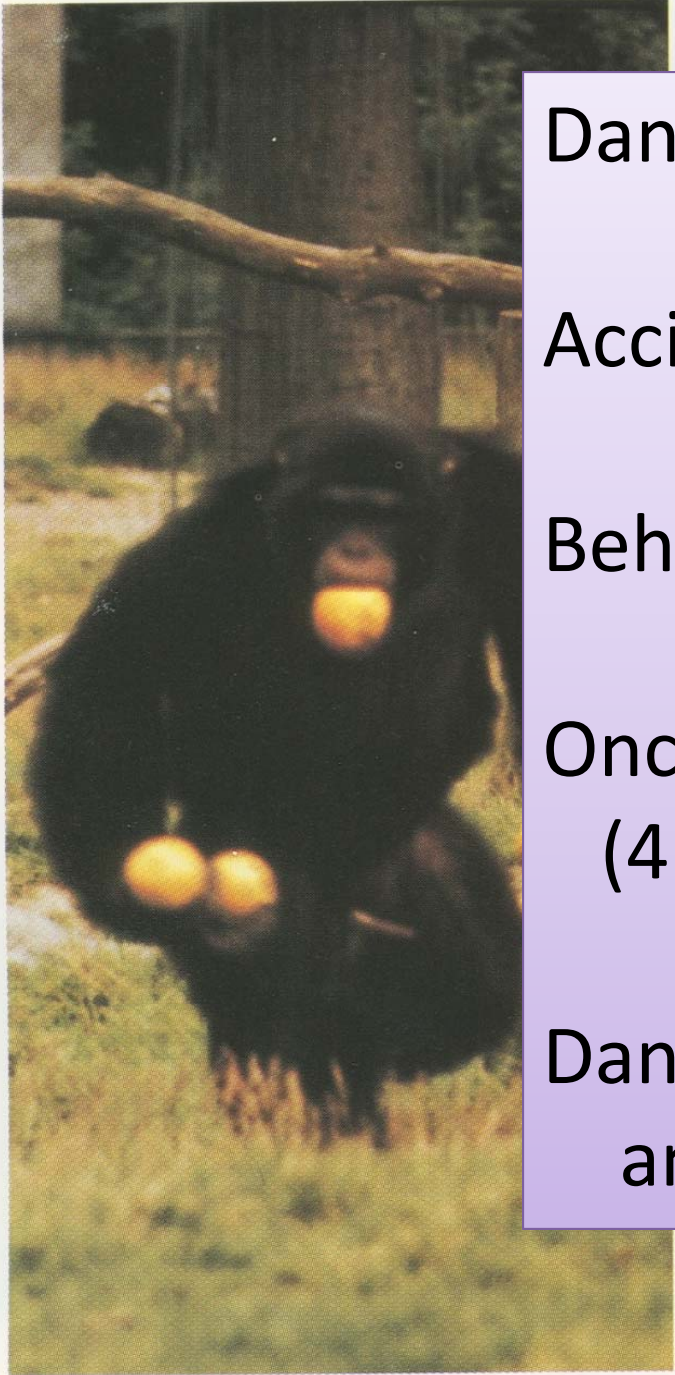
# What animals pass the mirror test?

1. Elephants
2. Chimpanzees
3. Gorillas
4. Bonobos
5. Dolphins
6. Magpie (crow family)



If an animal can recognize itself and others  
can recognize the social status  
can understand what signals mean

Then the animal might know how to  
“manipulate” others...



Dandy (a subordinate chimpanzee)

Accidentally discovered food source;

Behaved as if he didn't know the food

Once dominants were asleep;  
(4 hours later)

Dandy returned to the food source  
and ate all the food.

# 1. Food manipulation in Chimpanzees

1. Gave a young male some bananas, he uttered loud food barks; then attracted older dominant males, bananas were taken by older males
2. The next day gave the same young male bananas, he made “faint” choking sounds

Pioneered study by Jane Goodall

## Jane Goodall: pioneered primatologist (1934~ )



Her methods of studying animals in the wild, which emphasized patient observation over long periods of time of both social groups and individual animals, changed not only how chimpanzees as a species are understood, but also how studies of many different kinds of animals are carried out.



Over time, the chimps became sufficiently used to her presence that she could creep closer, no longer needing binoculars to observe them. With this advance she began to make field observations that soon revolutionized the field of primatology.

# Trickery and deception

Many examples  
in chimps, monkeys...





A subordinate male checks to make sure no dominants are watching before attempting to mate with the female.

If a female monkey has a rendezvous with a subordinate male behind a tree, she peeks out periodically to check on the alpha's movements, or exposes her head and pretends to be foraging.



Female chimp may feign indifference when solicited by a subordinate male within sight of a dominant. When out of sight of the alpha, the same females solicit copulations from the favored subordinate and suppress the normal screams that accompany climax.





A chimp called Kanzi was notoriously mischievous, and frightened a new keeper by disappearing; a complete search of his quarters, roof and all, failed to locate the chimp. As it turns out, Kanzi had flattened himself on a bed, covered his body with blankets, and lain completely still for 20 minutes, only to emerge laughing when unable to contain himself any longer.

# Summary

Evolution of intelligence /cognition,  
how does it come about?

How do social animals develop the complicated social /cognitive skills ?

How do animals come by the  
social skills they require to  
understand and manipulate the  
behavior of others?

Much of the social polish seems  
to be picked up during **play**

# What is play?

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# Dogs love to play



The drive to play is especially evident in certain breeds of dogs.

# Do invertebrates play?

Honey bees: play-flight

# Honeybee workers

(lifespan=1month)

1. Hatch ~ 2,3 weeks old:  
Nursing bees (sitters)



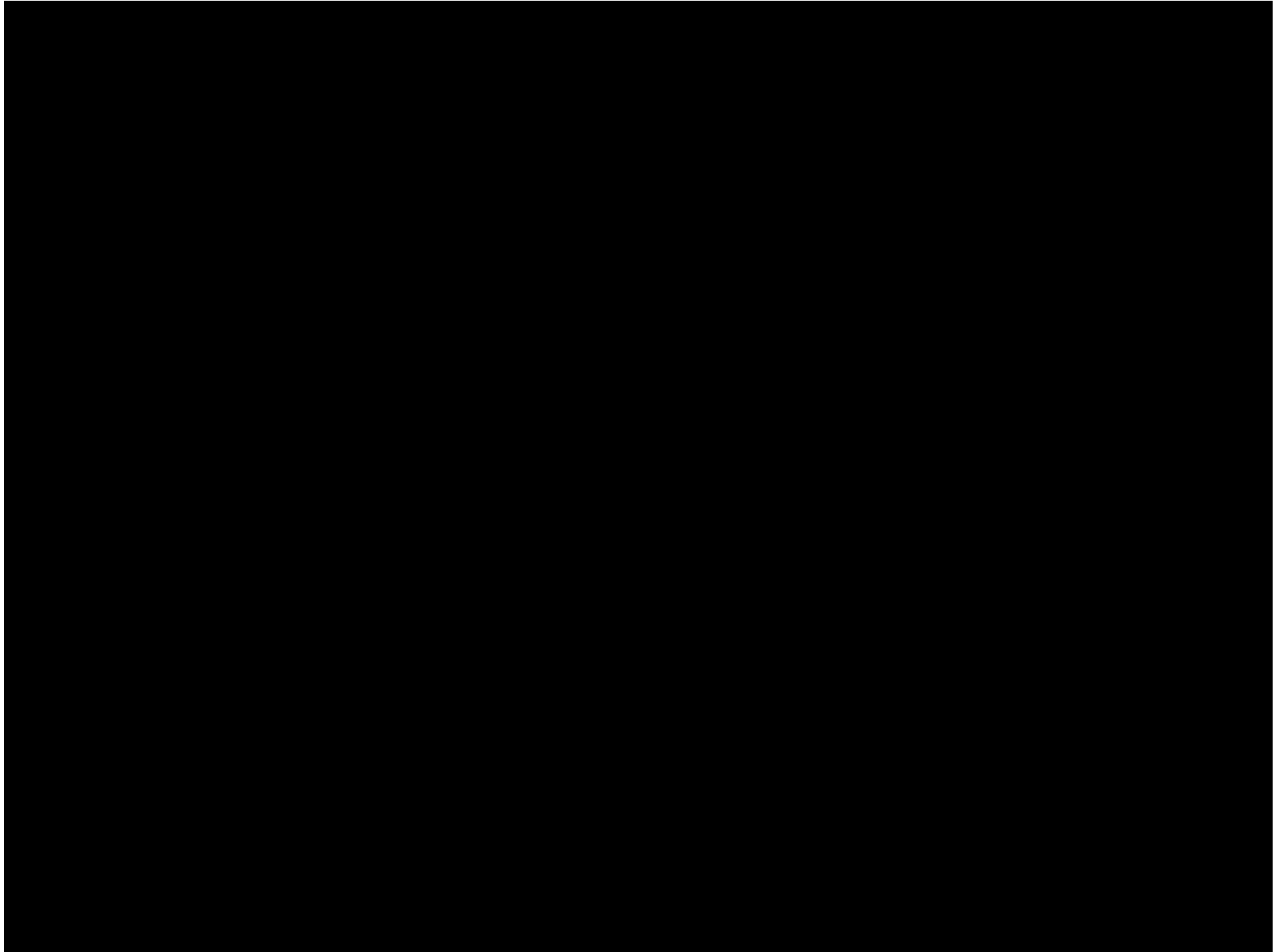
2. Then head out, become foragers

→ Fly/ play around the nest

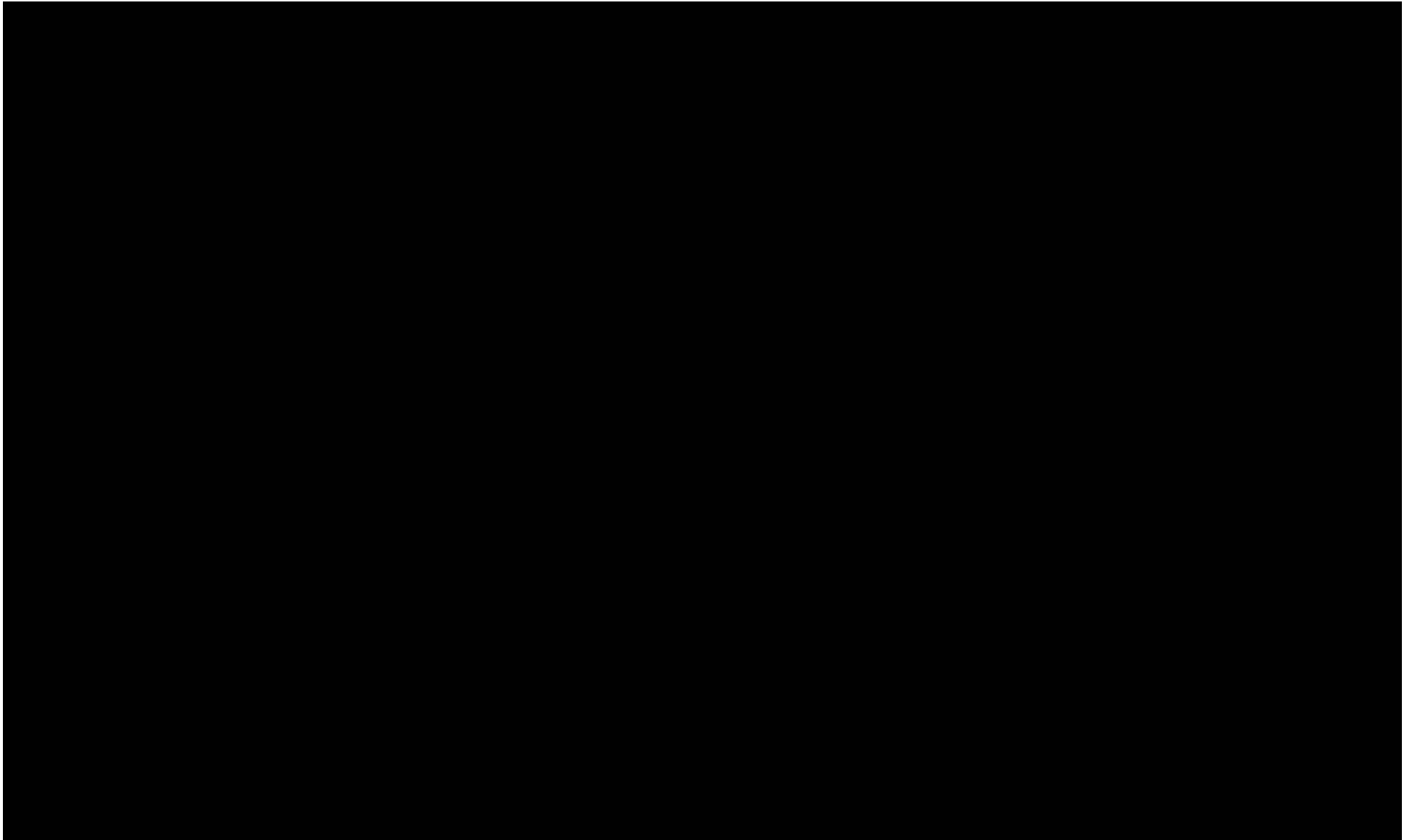




# Birds--Ravens



# Dolphins



# How do animals know they are playing, not involved in real activity?



Play markers

**FIGURE 15.12. Play face in gorillas.**

Preceding bouts of aggressive play, juvenile gorillas use a facial gesture called a “play face,” which appears to signal that “what is about to occur is play.” (Photo credit: William H. Calvin)

# The role of PLAY on Animal Mind

Play is a consistent characteristic of the species we see as highly intelligent

-- play is connected to some important aspects of cognition

# Function of play (ultimate causes)

1. Play aids in the development of cognitive (mind) and motor skills
2. Play promote kin recognition/  
social learning

# Speech learning : Babbling (error correction process)

Vocal playing?



Babbling of a 1.5-year-old infant

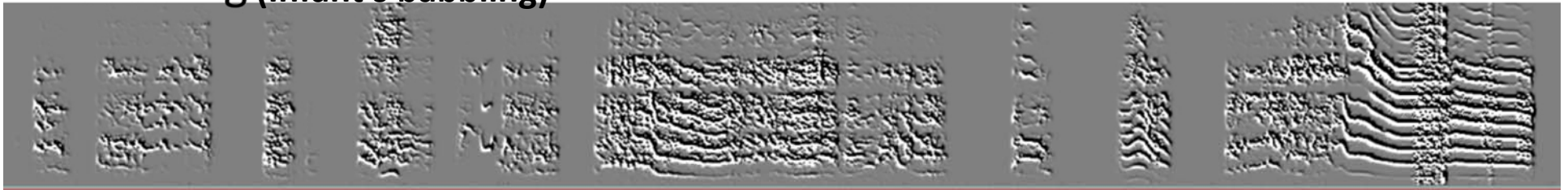
“bow wow wow wow va wa....wee wee wee...

m hi daddy ba ma ba wow wa wa.... Den da daddy daddy!”

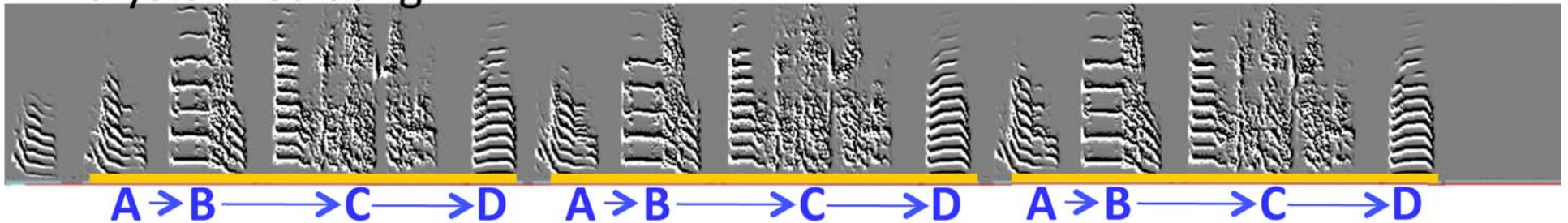
Kroodsma 1972

# Bird babbling is vocal-motor playing?

subsong (Infant's babbling)



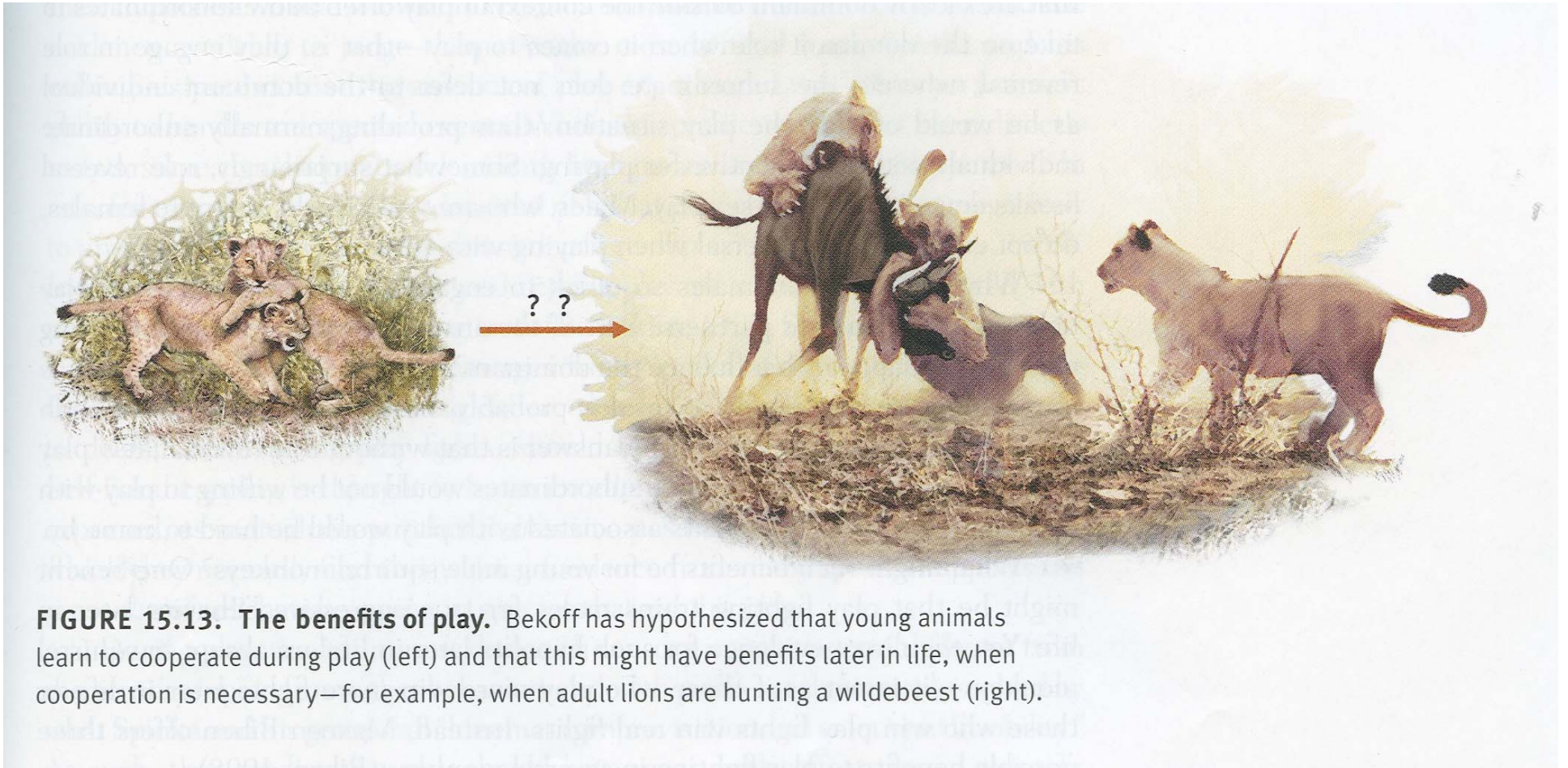
crystallized song



Zebra finch



# Function of social play



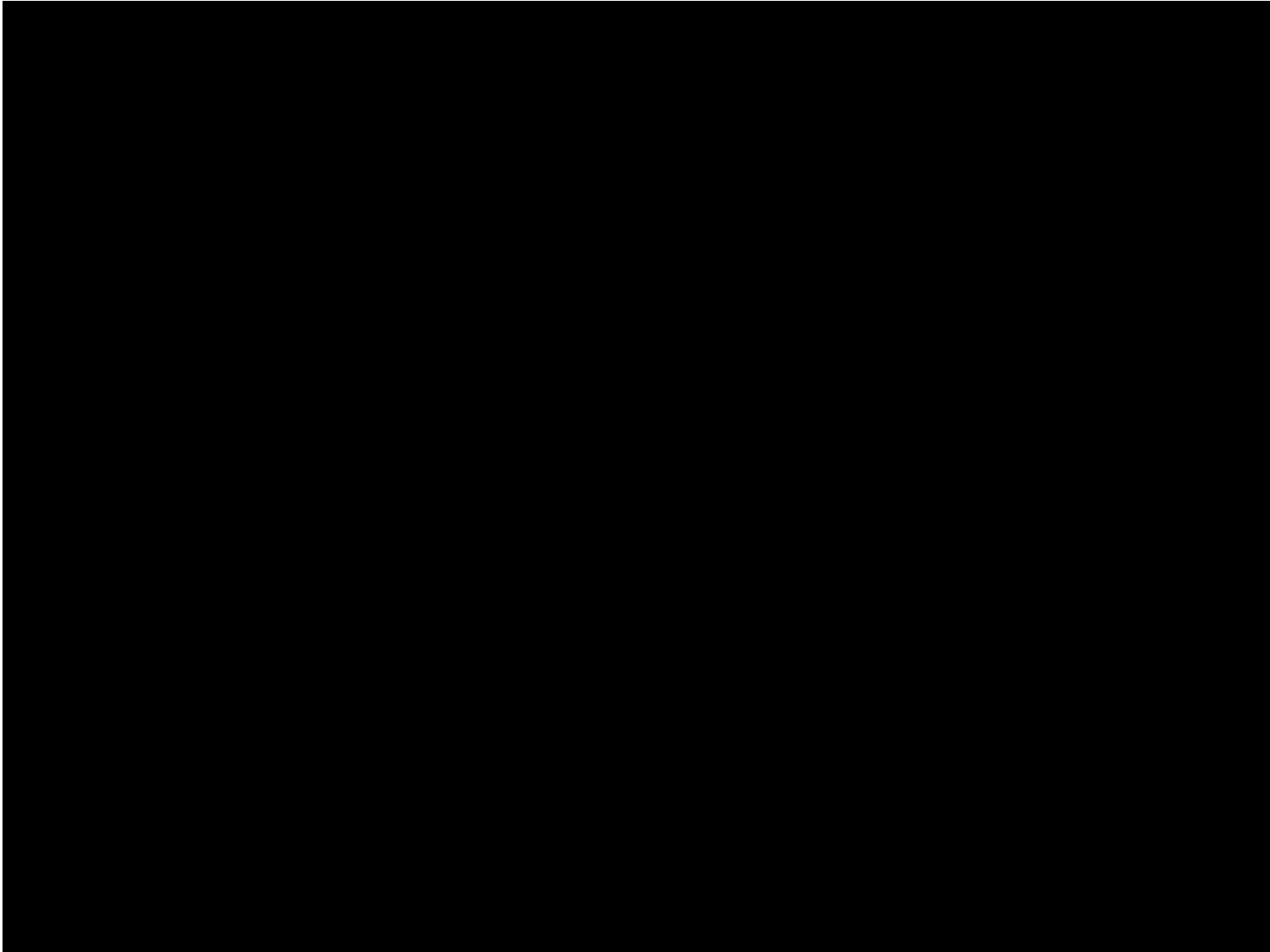
**FIGURE 15.13. The benefits of play.** Bekoff has hypothesized that young animals learn to cooperate during play (left) and that this might have benefits later in life, when cooperation is necessary—for example, when adult lions are hunting a wildebeest (right).



# Adult Bighorn sheep fight

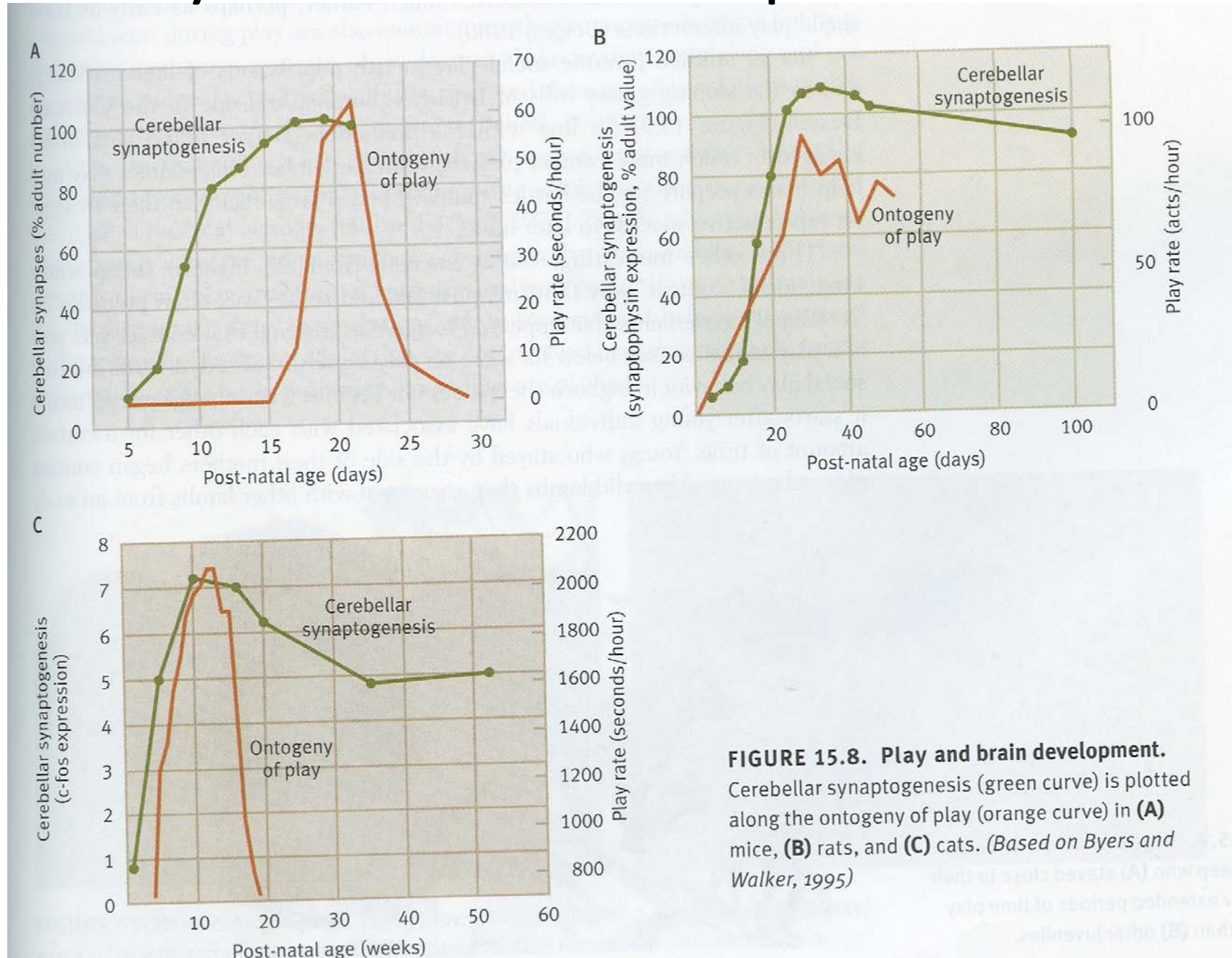


# Juvenile Bighorn sheep play



# Proximate causes of play

# Play and brain development



**FIGURE 15.8. Play and brain development.** Cerebellar synaptogenesis (green curve) is plotted along the ontogeny of play (orange curve) in **(A)** mice, **(B)** rats, and **(C)** cats. (Based on Byers and Walker, 1995)

# Proximate causes of play

## Play fighting and hormones in rats

1. Higher testosterone  $\leftarrow \rightarrow$  more play-fight
2. Brain hormone (dopamine, serotonin...) associated with play-fight